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Pharmacognostical and Phytochemical Evaluation of Jasminum Multiflorum

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ABSTRACT

Medicinal plant are nature's gift to mankind and have served as a cornerstone for healthcare across the world for thousands of years. Jasminum multiflorum (Andrews) Burm.f., commonly known as Star Jasmine, is a perennial evergreen shrub belonging to the family Oleaceae. It holds an eminent place in traditional medicinal system such as Ayurveda, Siddha, and Unani, where it is prescribed for ailments including fever, skin diseases, wounds, inflammation, and rheumatism. The leaves of J. multiflorum are rich in diverse classes of bioactive phytochemical such as flavonoids, tannins, glycosides, alkaloids, phenolic compounds, and terpenoids, which are responsible for its wide spectrum of pharmacological activities. Pharmacognostical studies of the leaves show characteristic features including dorsiventral leaf anatomy, multicellular trichomes, paracytic stomata, and calcium oxalate crystals, which serve as diagnostic markers for identification and authentication. Phytochemical screening of various solvents extracts confirms the presences of several bioactive groups, with the methanolic extract yielding the highest content of flavonoids and phenolics. Advanced analytical techniques such as FTIR, NMR, and GC-MS have identified compounds like triacontane, tetratriacontane, quercetin, rutin, and long-chain hydrocarbons, which are associated with antioxidants and antimicrobial potential.

Pharmacological evaluation hasdemonstrated that J. multiflorum leaf extract possesses potent antioxidant, antimicrobial, anti-inflammatory, and wound-healing activities. comparative studies also reveal that this species such as such as J. sambac and J. grandiflorum. The integration of traditional knowledge with modern phytochemical evidence strongly supports the medicinal value of J. multiflorum. Hence, this plant can serve as a potential source of natural therapeutic agents and may play a vital role in the development of standardized herbal formulations, cosmeceuticals, and phytopharmaceuticals in the near future.

KEYWORDS: Medicinal plant, Jasminum multiflorum, oleaceae, Phytochemicals, Dorsivental leaf anatomy, Long-chain hydrocarbons, antioxidant, antioxidant

I. INTRODUCTION

MEDICINAL PLANTS

Medicinal plants are nature's gift to mankind and have served as a cornerstone for healthcare across the world for thousands of years. Long before the advent of synthetic drugs, people relied entirely on plant-based products to cure diseases and maintain health. Even today, according to the World Health Organization (WHO), nearly 80% of the global population depends on herbal medicines for their primary healthcare needs, especially in developing countries.

Medicinal plants are rich sources of naturally occurring bioactive compounds known as secondary metabolites, which include alkaloids, glycosides, flavonoids, tannins, saponins, terpenoids, and phenolic acids. These compounds exhibit significant pharmacological activities such as anti-inflammatory, antimicrobial, antioxidant, antidiabetic, hepatoprotective and anticancer effects. The therapeutic potential of these plants lies in their ability to interact with biological systems, providing preventive and curative benefits with minimal side effects.

Pharmacognosy is the branch of pharmaceutical science that deals with the identification, authentication, and standardization of natural drugs plays a crucial role in the scientific validation of medicinal plants. Modern analytical and spectroscopic tools like FTIR, NMR, and GC-MS help identify and quantify active constituents, providing a scientific basis for their medicinal claims.

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In the current era of increased chemical exposure and drug resistance, there is growing interest in phytochemical as it offers safer and more biocompatible alternatives to synthetic drugs. Herbal remedies are also sustainable, culturally acceptable, and eco-friendly. Plants like Azadirachtaindica (Neem), Ocimum sanctum (Tulsi), Curcuma longa (Turmeric), and Aloe vera have already been validated for their therapeutic potential, paving the way for research on lesser-known species such as Jasminum multiflorum.

Thus, studying medicinal plants not only preserves traditional knowledge but also contribute to new drug discovery and the global herbal industry's expansion.

JASMINUM MULTIFLORUM

Jasminum multiflorum (Andrews) Burm.f., belonging to the family Oleaceae, is a well known medicinal and ornamental shrub commonly called Star jasmine or Downy jasmine. It is indigenous to India, Sri Lanka. and Southern Asia, and is widely cultivated across tropical regions for its aesthetic beauty and strong fragrance. The plant is a perennial evergreen shrub with slender stems, opposite ovate leaves, and clusters of stars shaped white flower.

In the traditional Indian systems of medicines Ayurveda and Siddha. The plant is recognized for its therapeutic, aromatic, and cosmetic properties. The leaves are used externally to heal wounds, ulcers, boils, and skin inflammations, while internally, they are prescribed for fever, rheumatism, and respiratory disorders. The root decoction is believed to act as an antidote for cobra venom. The flowers, apart from their use in perfumery, are also valued in religious rituals and cosmetics.

Science investigations have confirmed many of these traditional uses. Phytochemical studies on J. multiflorum leaves have revealed a variety to bioactive constituents, including flavonoids (quercetin, rutin), tannins, alkaloids, saponins, and phenolic acids, which contribute to its pharmacological effects. These compounds exhibit antioxidant, antimicrobial, anti-inflammatory, and cytoprotective activities.

Microscopic and physiochemical analyses further authenticated the plant by identifying structural features like multicellular trichomes, paracytic stomata, and calcium oxalate crystals, which serve as unique diagnostic markers. Modern analytical techniques such as Fourier Transform Infrared (FTIR) spectroscopy, Gas Chromatography-Mass Spectroscopy (GC-MS), and Nuclear Magnetic Resonance (NMR) studies have helped in identifying several key components that explain the plant's therapeutic efficacy.

Because of its rich phytochemical profile and pharmacological versatility, Jasminum multiflorum is now recognized as a promising candidate for the development of standardized herbal formulations, phytomedicines, and cosmeceutical products. Its combination of traditional relevance and modern scientific validation makes it an ideal subject for pharmacognostical and phytochemical research.

Figure: 01 (Jasminum multiflorum plant)

TAXONOMICAL CLASSIFICATION OF JASMINUM MULTIFLORUM

Kingdom: Plantae
Sub-kingdom: Tracheobionta (Vascular plants)
Division: Angiosperms
Class: Dicotyledons
Order: Lamiales
Family: Oleaceae
Genus: Jasminum L.
Species: Jasminum multiflorum (Andr.) Burm. f.

VERNACULAR NAMES OF JASMINUM MULTIFLORUM

English: Star Jasmine / Downy Jasmine
Tamil: Kundumalligai / Kundu Malli
Sanskrit: Kunda / Kunda Pushpa
Hindi: Chameli / Jati Malli
Malayalam: Kundappoo / Kunda Mali
Telugu: Kundamu
Kannada: Kunda Hoovu
Bengali; Bela Mallika
Marathi: Kunda Phool
Sri Lanka: Pichcha

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BOTANICAL DESCRIPTION OF JASMINUM MULTIFLORUM

Jasminum multiflorum (Andrews) Burm. f., commonly known as star jasmine or Kundumalligai is an evergreen, perennial, climbing shrub belonging to the family Oleaceae. It is cultivated widely across tropical and subtropical regions for its aromatic flowers and medicinal value.

HABIT

The plant is a woody climber or scandent shrub, reaching up to 2 meters in height. It bears numerous slender, pubescent branches. Young stems are green and flexible, while older ones become woody and brown. The plant produces dense clusters of star shaped white flowers that are highly fragrant and open during the evening hours.

DISTRIBUTION

Jasminum multiflorum is nativeto India, Sri Lanka, and Southeast Asia. It grows abundantly in tropical and subtropical climates, preferring well-drained loamy soils and areas with moderates' humidity. The plant is cultivated extensively in South India, especially in Tamil Nau, Kerala, and Karnataka, as well as in Sri Lanka, Malaysia, and the Philippines. It grows well under full sunlight and is commonly found in gardens, temple premises, hedges, and rural households. Propagation is usually done through stem cutting or layering. Flowering occurs throughout the year, with maximum bloom during December to April.

TRADITIONAL USES OF JASMINUM MULTIFLORUM

PARTS OF PLANT	TRADITIONAL USES	SYSTEM OF MEDICINES
LEAVES	Used to treat skin diseases, wounds, ulcers, and inflammation; also used for fever and respiratory disorders.	Ayurveda and Siddha
FLOWERS	Used in perfumes, garlands, and herbal preparation; also applied for stress relief, headache, and as a mild sedative.	Ayurveda and Siddha and Unani
STEM	Used in wound healing and as a mild anti-inflammatory agent; sometimes used in decoctions for general health.	Ayurveda and Siddha
ROOT	Employed to treat fever, body pain, and inflammatory conditions.	Ayurveda
FRUITS	Occasionally used for reproductive health and as a mild laxative in traditional practices.	Ayurveda

Table: 01 (Traditional uses of Jasminum multiflorum)

PHARMACOGNOSTICAL EVALUATION OF JASMINUM MULTIFLORUM

MACROSCOPIC CHARACTER OF JASMINUM MULTIFLORUM

PARTS	DESCRIPTION	IMAGES
LEAVES	Simple, opposite, ovate with entire margins, smooth above, hairy beneath; these are the most widely used medicinal parts of the plant.	

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FLOWERS	White, tubular, star-shaped, and highly fragrant; used in perfumery, aromatherapy, and cosmetic application.	
STEM	Woody, pubescent, and used mainly for propagation.	
ROOTS	Cylindrical, woody, and light brown, used for fever, rheumatism, and as an antidote to snakebite.	
FRUITS (RARELY SEEN IN CULTIVATION)	Small, globose, and black when ripe; rarely produced under cultivation.	

Table : 02 (Macroscopic character of Jasminum multiflorum)

MICROSCOPIC CHARACTER OF JASMINUM MULTIFLORUM

Transverse Section (TS) of the leaf shows a dorsiventral structure. The upper epidermis consists of a singles layer of rectangular cells covered by a thin cuticle. Beneath the epidermis lies the palisade parenchyma, composed of elongated cells containing abundant chloroplasts. The spongy parenchymal is loosely arranged with air spaces and scattered vascular strands.

The lower epidermis bears paracytic stomata, more abundant than on the upper surface. Multicellular uniseriate trichomes are distributed on both surfaces, particularly on the veins. Calcium oxalate crystals, both prism and cluster types, are present in mesophyll cells. The midrib region contains an arc-shaped vascular bundle with xylem vessels facing the upper surface and phloem towards the lower side.

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POWDER MICROSCOPY

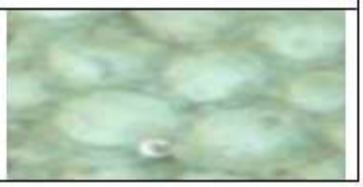
CHARACTER	DESCRIPTION	IMAGES
STOMATA	Anisocytic type, present on both surfaces.	
TRICHOMES	Unicellular and unbranched, found on the epidermal surface.	
XYLEM VESSELS AND FIBRES	Elongated with spiral and reticulate thickening. Long, narrow, and lignified with tapering ends.	
PARENCHYMA CELLS	Thin-walled, polygonal cells with contents.	

Table: powder microscopy of jasmine multiflorum

PHYSIOCHEMICAL PARAMETERS

PARAMETER	OBSERVED VALUE (%)
Total ash value	2.83
Acid insoluble ash	5.24
Water soluble ash	4.50
Alcohol soluble extractive	12.30
Water soluble extractive	18.70
Moisture content	7.10

Table : Physiochemical parameter of Jasminum multiflorum

PHYTOCHEMICAL CONSTITUENTS OF JASMINUM MULTIFLORUM

EXTRACTION:

The dried, coarsely powdered leaves are successively extracted using solvents of increasing polarity petroleum ether, chloroform, ethyl acetate, methanol, and water through Soxhlet extraction. The methanolic extract shows the highest percentage yield, followed by aqueous extract, indicating that polar compounds are predominant.

Phytochemical class	Presences	Pharmacological role
Alkaloids	+	Antimicrobial, Analgesic
Flavonoids	+++	Antioxidant, Anti-inflammatory
Tannins	+++	Astringent, Wound healing
Saponins	++	Antimicrobial, Expectorant

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Glycosides	++	Cardiotonic, Antioxidant
Terpenoids	++	Anti-inflammatory
Steroids	+	Hormonal regulator
Phenols	+++	Antioxidant, Antimicrobial

(+ - Present, ++ - Moderate, +++ - Abundant)

Table: Phytochemical evaluation of Jasminum multiflorum

PHARMACOLOGICAL ACTIVITY OF JASMINUM MULTIFLORUM

1. ANTI-INFLAMMATORY ACTIVITY

Methanolic and ethanolic extracts of Jasminum multiflorum leaves have shown significantanti-inflammatory potential in carrageenan induced paw edema and cotton pellet granuloma models in rats. The inhibitory effects is comparable to standard anti-inflammatorydrugs like indomethacin, suggestion the presence of active flavonoids and triterpenoids responsible for suppressing prostaglandin synthesis and reducing tissues inflammation.

2. ANTIMICROBIAL ACTIVITY

Extracts of J. multiflorum leaves, flowers, and roots possess potent antibacterial and antifungal activity against a wide range of pathogens including Staphylococcus aures, Escherichia coli, Pseudomonas aeruginosa, and candida albicans. The ethanolic extract showed a remarkable zone of inhibition indicating the plant's potential as a natural antimicrobial agent. This activity is mainly due to phenolic and terpenoids compounds.

3. ANTIOXIDANT ACTIVITY

The plant demonstrates strong free radical scavenging activity in DPPH and FRAP assays. The methanolic extract exhibited dose-dependent antioxidant potential attributed to the presence of flavonoids, tannins, and phenolic acids, which help neutralize reactive oxygen species (ROS) and prevent oxidative stress-related cellular damage.

4. WOUND HEALING ACTIVITY

Topical application of J. multiflorum leaf extract on excision and incision wound modls in rats significantly accelerated the rate of wound contraction, increased tensile strength, and enhanced epithelialization. The improvement in collagen synthesis and fibroblast proliferation confirms the plant's role in wound repair and tissue regeneration.

5. ANTIPYRETIC AND ANALGESIC ACTIVITY

The ethanolic extract J. multiflorum leaves exhibited notable antipyretic activity in yeast induced pyrexia models and showed analgesic effects in hot-plate and tail-flick method. These effects may be attributed to the inhibition of prostaglandin synthesis and modulation of pain mediators.

6. ANTIDIABETIC ACTIVITY

Preliminary studies have demonstrated that J. multiflorum leaf extract significantly reduces blood glucose levels in streptozotocin induced diabetic rats. The mechanism may involve enhancement of insulin secretion and glucose uptake, supported by the presence of flavonoids and saponins that exhibit hypoglycemic action.

7. HEPATOPROTECTIVE ACTIVITY

The methanolic extract of J. multiflorum leaves protected livern tissues from carbon tetrachloride toxicity in experimental animals. Biochemical estimation revealed reduced levels of SGOT, SGPT and bilirubin, confirms its hepatoprotective efficacy. The antioxidant compound help stabilize hepatic membrane and promote detoxification.

8. ANTICANCER ACTIVITY

Some in-vitro studies revealed that the ethyl acetate and methanolic extracts of J. multiflorum possess cytotoxic activity against human HeLa and MCF-7. The flavonoids and triterpenoids may induce apoptosis and inhibit tumor cell proliferation, indicating its potential as a source of anticancer phytochemicals.

9. OTHER REPORTED ACTIVITIES

A. ANTIHELMINTIC – Effective against pheretima Posthuma worms.
B. ANTI DEPRESSANT ACTIVITY – Exhibited CNS stimulatory and mood elevating effects.

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C. ANTIALLEGIC ACTIVITY – Reduced histamine induced skin reaction.

II. CONCLUSION

The present review and evaluation of Jasminum multiflorumhighlight its remarkable pharmacognostical and phytochemical significance. The detailed pharmacognostic studies, including microscopic, macroscopic, and physicochemical analyses, serve as reliable parameters for the proper identification and standardization of the plant. These characteristic help in preventingadulteration and ensuring the authenticity of the crude drug.

Phytochemical investigation reveal that J. multiflorum leaves contain a rich spectrum of bioactive secondary metabolitessuch as alkaloids, flavonoids, glycosides, tannins, saponins, terpenoids, and phenolic compounds. These constituents are primarily responsible for the diverse pharmacological activities exhibited by the plant, including antioxidant, anti-inflammatory, antimicrobial, wound healing and hepatoprotective properties.

Overall, Jasminum multiflorum represents an important medicinal species with immense therapeutic potential. Its pharmacognostical and phytochemical profile provides a strong scientific basis for its traditional uses in herbal medicines. However, further research is recommended to isolate and characterize individualbioactive compounds, establish their mechanisms of action, and evaluate their safety and efficacy through preclinical and clinical studies. Such studies will help in the development of standardized herbal formulation and novel plant-based drugs derived from Jasminum multiflorum.

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